MULTIMEDIA UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

**TRIMESTER 2, 2019/2020**

## BEC2054 – ECONOMETRICS II

(All Sections/ Groups)

10 MARCH 2020
2.30 p.m. - 4.30 p.m.
(2 Hours)

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**INSTRUCTIONS TO STUDENTS**

1. This Question paper consists of **FIVE** pages with **FOUR** questions only.
2. Attempt **ALL FOUR** questions. The distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

## QUESTION 1 (25 marks)

(a) Write **short notes** to explain the following econometric concepts:

(i) Exogenous variable (3 marks)

(ii) Order condition (3 marks)

(iii) Spurious regression (3 marks)

(b) Explain with a brief reason whether the following statements are true, false, or uncertain:

(i) The Granger test is a test of precedence rather than a test of causality. (4 marks)

(ii) All econometric models are essentially dynamic. (4 marks)

(iii) The method of ordinary least square is not applicable to estimate a structural equation in a simultaneous-equation model. (4 marks)

(iv) In case an equation is not identified, two stage least square is not applicable. (4 marks)

## QUESTION 2 (25 marks)

(a) Consider the following two-equation model:

Demand: $P_t = B_0 + B_1Q_t + B_2X_t + e$ ... (2.1)
Supply: $Q_t = \alpha_0 + \alpha_1P_{t-1} + e$ ... (2.2)

where
$Q_t$ = quantity in the current period
$X_t$ = an exogenous variable in the current period
$P_t$ = price in the current time period
$P_{t-1}$ = price in the previous time period

(i) Analyse if equation (2.1) can be estimated using ordinary least square. (4 marks)

(ii) Analyse if equation (2.2) can be estimated using ordinary least square. (4 marks)

**Continued...**

(b) Each of the following models consists of a two-equation system for the demand and supply of umbrellas. Test whether each equation in each model satisfies the order condition or not. (8 marks)

**Model 1**

Demand: $Q = B_0 + B_1P + B_2INCOME + B_3RAIN + e$ ... (2.3a)

Supply: $Q = \alpha_0 + \alpha_1P + \alpha_2WAGE + e$ ... (2.3b)

**Model 2**

Demand: $Q = B_0 + B_1P + B_2INCOME + B_3RAIN + e$ ... (2.4a)

Supply: $Q = \alpha_0 + \alpha_1P + \alpha_2INCOME + \alpha_3PVINYL + e$ ... (2.4b)

where

Q = number of umbrellas sold each month

P = average real price of umbrellas each month

INCOME = real average monthly income

RAIN = average inches of rain each month

WAGE = average real monthly income earned by those assembling the umbrellas

PVINYL = average real monthly price of vinyl used to make umbrellas.

(c) Given the following results:

Disposable Income (DI) equation, Unrestricted:

$$\underset{t}{DI_t} = \underset{(6.987)}{0.623DI_{t-1}} + \underset{(2.543)}{0.267DI_{t-2}} + \underset{(1.422)}{0.043C_{t-1}} + \underset{(0.847)}{0.019C_{t-2}} \quad \text{... (2.5)}$$

$R^2 = 0.9952$ $d = 2.044$

Residual Sum of Squares = 5810.00

Disposable Income (DI) equation, Restricted:

$$\underset{t}{DI_t} = \underset{(7.421)}{0.711DI_{t-1}} + \underset{(3.869)}{0.301DI_{t-2}} \quad \text{... (2.6)}$$

$R^2 = 0.9890$ $d = 2.133$

Residual Sum of Squares = 5960.000

**Continued...**

Consumption (C) equation, Unrestricted:

$$\underset{t}{C_t} = \underset{(5.774)}{0.577C_{t-1}} + \underset{(4.343)}{0.481C_{t-2}} + \underset{(4.422)}{0.686DI_{t-1}} + \underset{(3.847)}{0.578DI_{t-2}} \quad \ldots (2.7)$$

$R^2 = 0.973$ $d = 1.986$

Residual Sum of Squares = 5432.084

Consumption (C) equation, Restricted:

$$\underset{t}{C_t} = \underset{(7.421)}{0.597C_{t-1}} + \underset{(4.569)}{0.468C_{t-2}} \quad \ldots (2.8)$$

$R^2 = 0.967$ $d = 2.011$

Residual Sum of Squares = 5742.306

Compute the F-statistics for both the Disposable Income (DI) and Consumption (C) equations. Based on the F-statistics, conclude if there is independence, unidirectional or bidirectional causality between DI and C.

[Hint: F statistic= $\frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)}$ where n = 123, m = number of lagged M term, k = number of parameters estimated in unrestricted regression; and $F_{df1, df2} = 2.33$].

(9 marks)

## QUESTION 3 (25 marks)

(a) Suppose that given the data on log GDP (Gross Domestic Product), you want to fit a suitable ARIMA model for a short-term forecast. Outline the **FOUR (4)** steps involved in carrying out this task. (10 marks)

(b) Explain **TWO (2)** major differences between simultaneous-equation and Box-Jenkins approaches to economic forecasting. (10 marks)

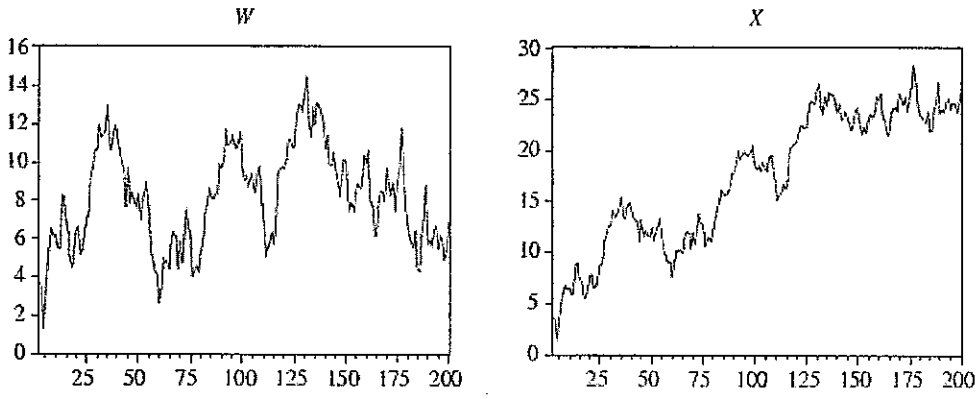
(c) Explain the phenomenon of volatility clustering in financial time series. (5 marks)

**Continued...**

## QUESTION 4 (25 marks)

(a) **Figure 4.1** shows plots of two time series.

**Figure 4.1 Time series plot**




Since W appears to be fluctuating around a nonzero mean, a Dickey–Fuller test (with constant but no trend) was performed on this variable. Since X appears to be fluctuating around a trend, a Dickey–Fuller test (with constant and trend) was performed for this variable. The results are shown below.

$$\begin{array}{lll} \widehat{\Delta W_t} & = 0.757 & -0.091 W_{t-1} \\ \tau & (2.154) & (-3.178) \end{array} \quad \ldots (4.1)$$

$$\begin{array}{lllll} \widehat{\Delta X_t} & = 0.782 & +0.171t & -0.092 X_{t-1} \\ \tau & (1.867) & (1.554) & (-3.099) \end{array} \quad \ldots (4.2)$$

The 5 percent τ critical values are –3.41 (constant with trend), and –2.86 (constant but no trend).

(i) State the null and alternative hypotheses for Dickey-Fuller test. (2 marks)

(ii) Test and provide conclusion on which series is/ are stationary, and which is/ are nonstationary. (5 marks)

**Continued...**

(b) Utilising quarterly data on disposable income (INCOME) and consumption (CONSUME) in Malaysia from 2005Q1 to 2019Q4, you obtain the following results:

$$\underset{t}{\widehat{CONSUME}_t} = \underset{(-2.154)}{-9084} + \underset{(9.191)}{0.9884}INCOME \quad \ldots (4.3)$$

$$\underset{\tau\ (-3.909)}{\widehat{\Delta e}_t = -0.316\hat{e}_{t-1}} \quad \ldots (4.4)$$

Based on the above estimation, given the 5 percent $\tau$ critical value of – 3.37, test and explain if the CONSUME is cointegrated with, or spuriously related to INCOME if

(i) CONSUME is I(2) and INCOME is I(1) variables (4 marks)

(ii) CONSUME and INCOME are I(1) variables (4 marks)

(c) Maisarah performed autoregressive conditional heteroscedasticity model (ARCH) test for the presence of second-order ARCH and obtained the following result (**Exhibit 4.1**):

**Exhibit 4.1**

Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 1.328720 | Prob. F(2,35) | 0.2078 |
| Obs*R-squared | 2.681615 | Prob. Chi-Square(2) | 0.2016 |

Is there any evidence of ARCH effect? Set your hypotheses, and then interpret the results.

(4 marks)

(d) Suppose the following time series model has been fit to historical data and found to be an adequate model.

$$Y_t = 35 + \varepsilon_t + 0.25\varepsilon_{t-1} - 0.30\varepsilon_{t-2} \quad \ldots (4.5)$$

The first four observations are $Y_1 = 32.5$, $Y_2 = 36.6$, $Y_3 = 33.3$, and $Y_4 = 31.9$. Assuming $\hat{Y}_1 = 35$ and $\varepsilon_0 = 0$, calculate forecasts for periods 5, and 6, with the period 4 being the forecast origin.

(6 marks)

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